Center Innovation Fund: JPL CIF

Next Generation Broadband Grating for Hyperspectral Thermal Infrared Imagers

Completed Technology Project (2015 - 2016)

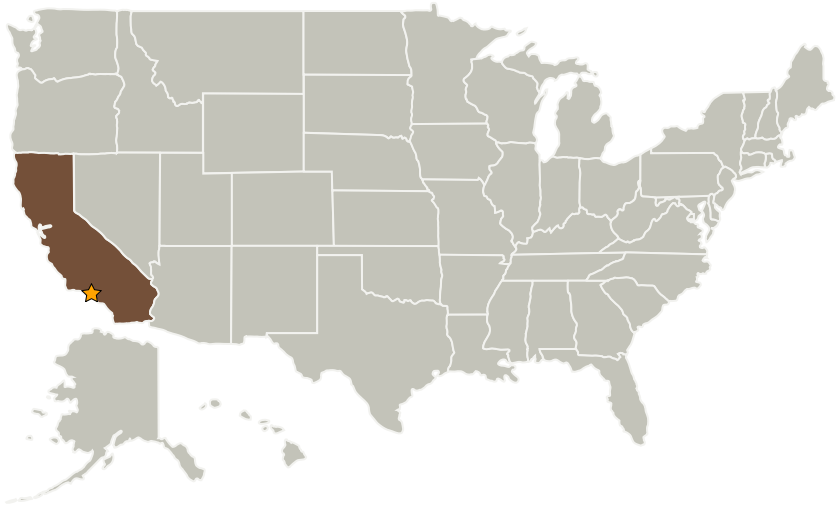
Project Introduction

Design and electron-beam fabricate a shaped-groove concave/convex grating to significantly extend the wavelength range of future airborne and space-based HyTES-like (Hyperspectral Thermal Emission Spectrometer) systems. Grating wavelength range will be 3 µm to 12 µm (MWIR-LWIR). Current HyTES wavelength range is 7.5 µm to 12 µm (LWIR only). The shaped-groove design can produce tailored efficiency to equalize instrument SNR across full wavelength range (compensates for signal and detector responsivity variation with wavelength). Flat efficiency shaped-groove proof of concept design shown at right. Concave/convex grating will be electron-beam fabricated using improved writing schemes to improve uniformity reduce ghosts/scatter. Grating performance (efficiency and scatter) will be measured in a laboratory setup (FY 2015 end state). Grating performance will be demonstrated in a laboratory breadboard spectrometer with a JPL HOT-BIRD* detector (FY 2016 end state).

Anticipated Benefits

Potential Applications: A MWIR-LWIR imaging spectrometer would allow retrieval of gases and other objects with features in the mid/thermal infrared in a single instrument. Greenhouse gases such as methane, carbon monoxide/dioxide and environmentally toxic fumes (benzene, toluene, etc.) could be detected. Follow-On Options: NASA: Picasso, Matisse, IIP, EV, Discovery; Outside: NRO, Federal projects (megacities)

Primary U.S. Work Locations and Key Partners



Next Generation Broadband Grating for Hyperspectral Thermal Infrared Imagers

Table of Contents

Project Introduction	1
Anticipated Benefits	1
Primary U.S. Work Locations and Key Partners	1
Organizational Responsibility	1
Project Website:	2
Project Management	2
Technology Maturity (TRL)	2
Technology Areas	2

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Jet Propulsion Laboratory (JPL)

Responsible Program:

Center Innovation Fund: JPL CIF

Center Innovation Fund: JPL CIF

Next Generation Broadband Grating for Hyperspectral Thermal Infrared Imagers

Completed Technology Project (2015 - 2016)

Organizations Performing Work	Role	Type	Location
★Jet Propulsion Laboratory(JPL)	Lead Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations
California

Project Website:

https://www.nasa.gov/directorates/spacetech/home/index.html

Project Management

Program Director:

Michael R Lapointe

Program Manager:

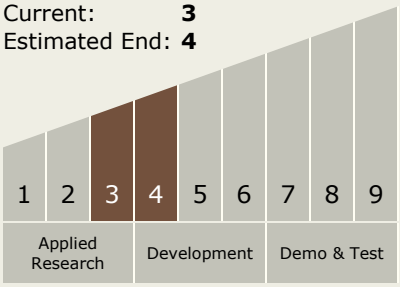
Fred Y Hadaegh

Principal Investigator:

Daniel W Wilson

Technology Maturity (TRL)

Start: **3**
Current: **3**
Estimated End: **4**



Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.1 Detectors and Focal Planes